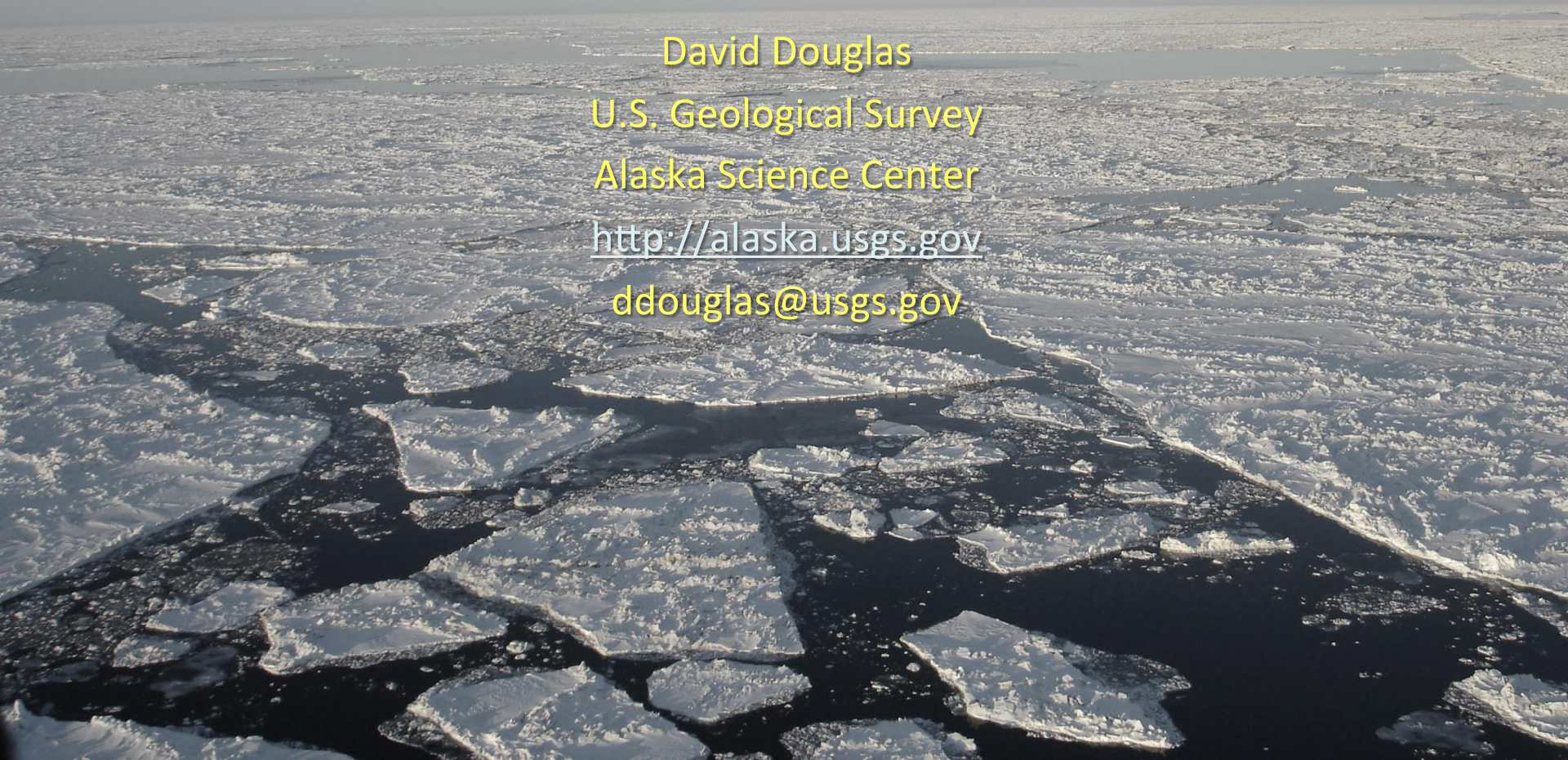


Distribution and movements of Arctic marine mammals in response to sea ice loss

David Douglas
U.S. Geological Survey
Alaska Science Center
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ddouglas@usgs.gov



How do we make smart decisions about a changing world?

**Start
with Science**

There are 7 billion people on Earth, and that number is increasing every day — human influence on our planet is ever more apparent. Changes to the natural world combined with growing human demands threaten our health and safety, our national security, our economy and our quality of life.



USGS Science Mission Areas

| Core Science Systems | Ecosystems |
|-----------------------------|-----------------|
| Climate and Land Use Change | Natural Hazards |
| Energy and Minerals | Water |
| Environmental Health | |

USGS Alaska Science Center: Changing Arctic Ecosystems Initiative



OUTLINE:

- Future outlook (projections)
- Observational studies

Polar bears (USGS)

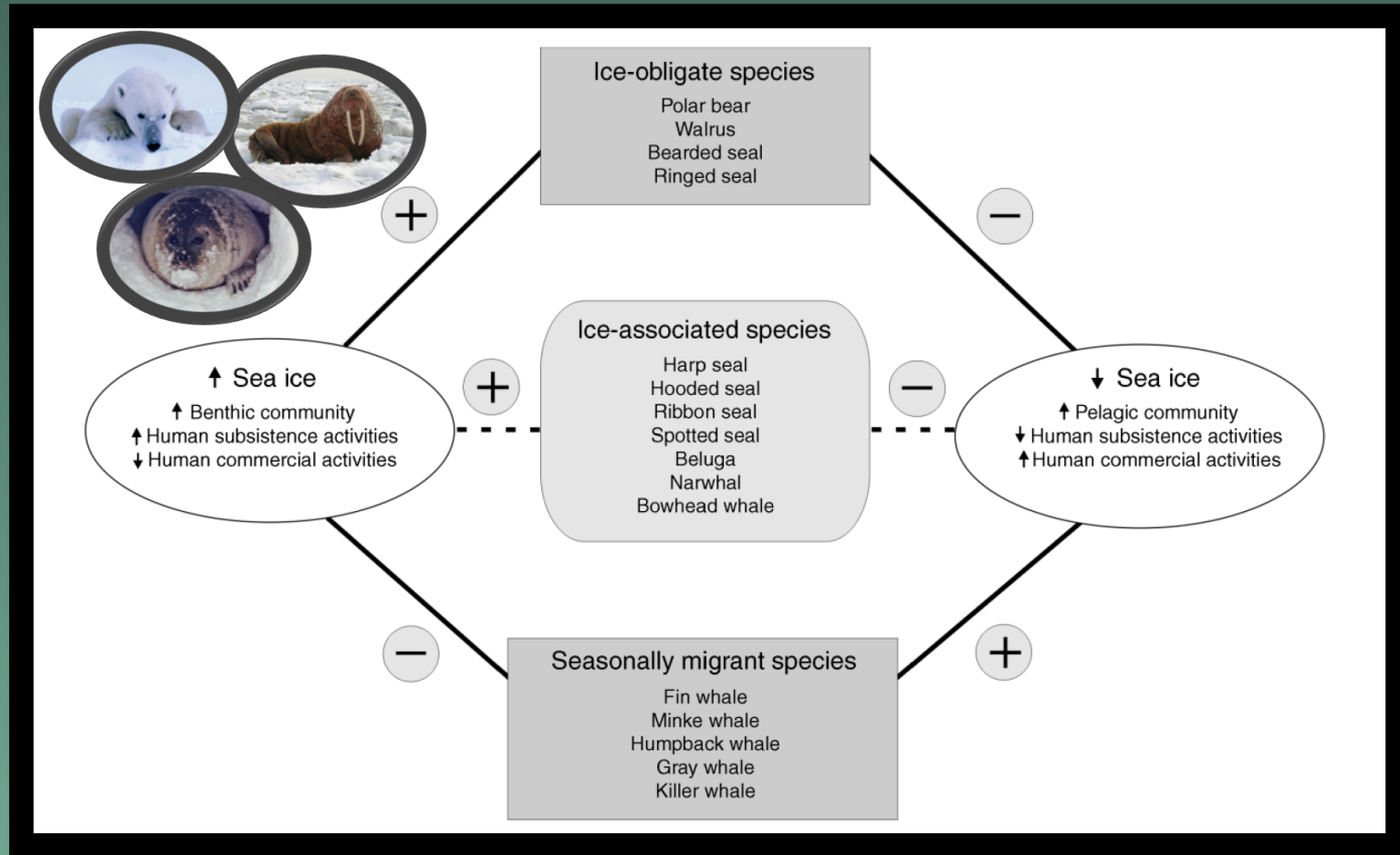
Pacific walruses (USGS)

Humpback and beluga whales (ADF&G)

Ringed and spotted seals (NSB)



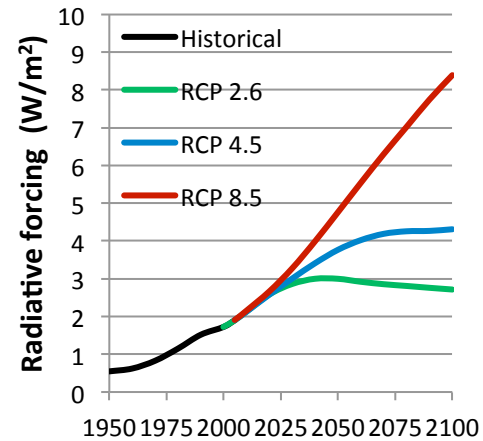
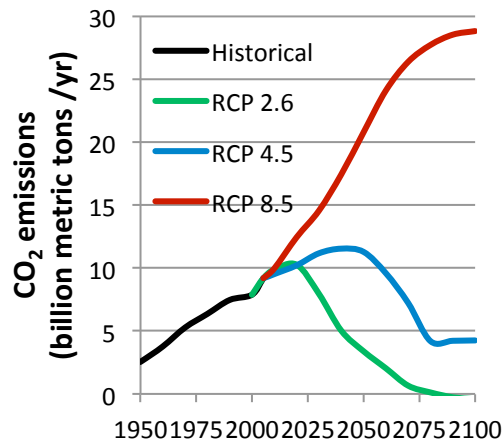
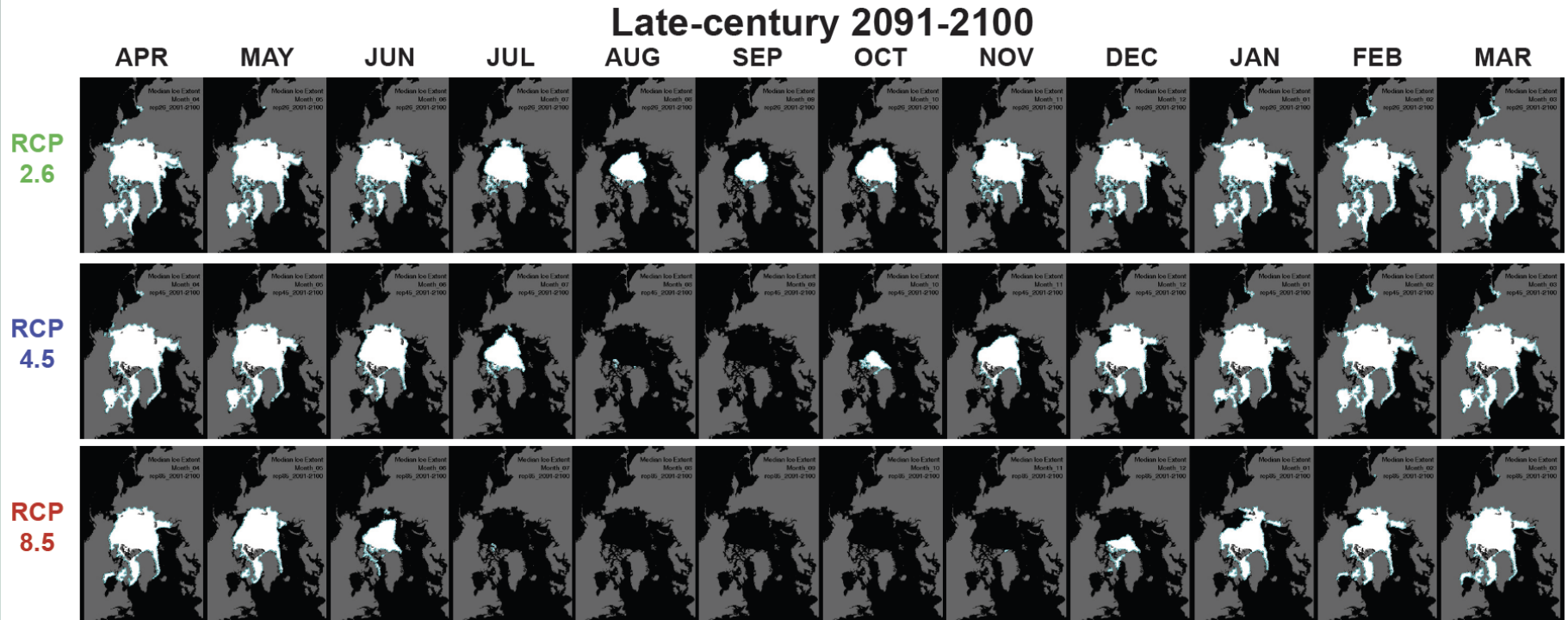
Arctic marine mammals and climate change: impacts and resilience



Moore and Huntington, 2008. Ecol. Appl.



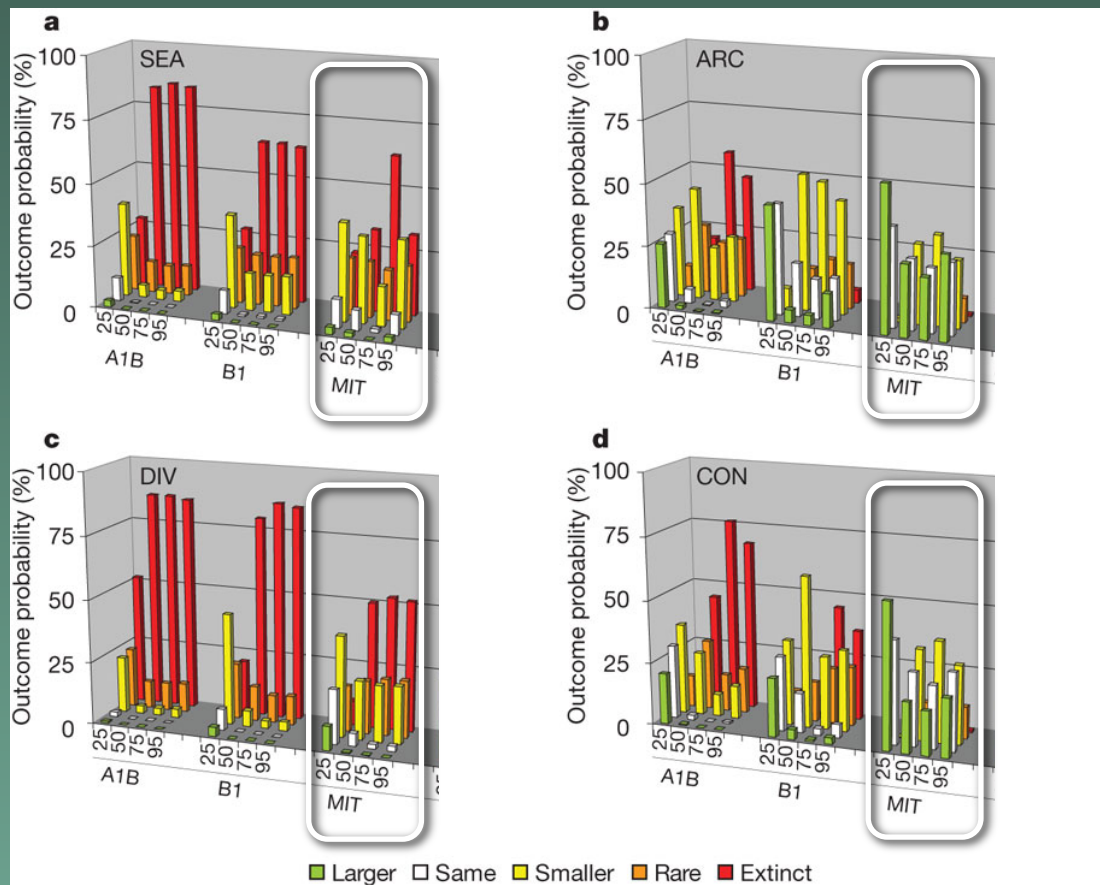
Future implications of sea ice loss depend on future levels of global emissions



http://alaska.usgs.gov/science/biology/habitat_dynamics/sea_ice_future.php



Bayesian network models to infer future polar bear population status

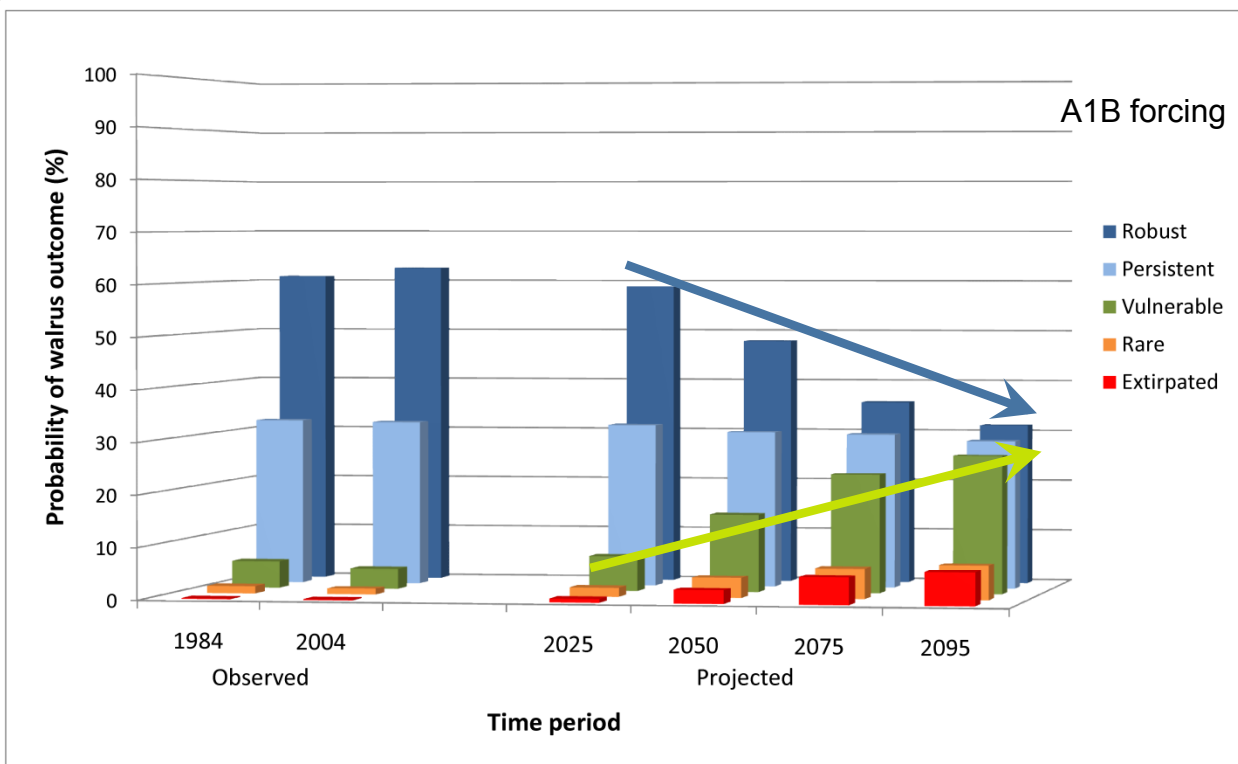


Greenhouse gas mitigation (MIT) can reduce sea-ice loss and increase polar bear persistence

<http://www.nature.com/nature/journal/v468/n7326/abs/nature09653.html>



Projected status of the Pacific walrus in the 21st century



Jay, et al. (2011) Polar Biol.





USGS science staff:

Todd Atwood, George Durner, Kristin Simac,
Karyn Rode, Anthony Pagano, Jeff
Bromaghin, Lily Peacock, Ty Donnelly,
Steve Amstrup (retired)

[Polar Bear Project website](#)



USGS science staff:

Chad Jay, Tony Fischbach, Mark Udevitz,
Rebecca Taylor, Sarah Sonsthagen, Brian
Battaille, William Beatty

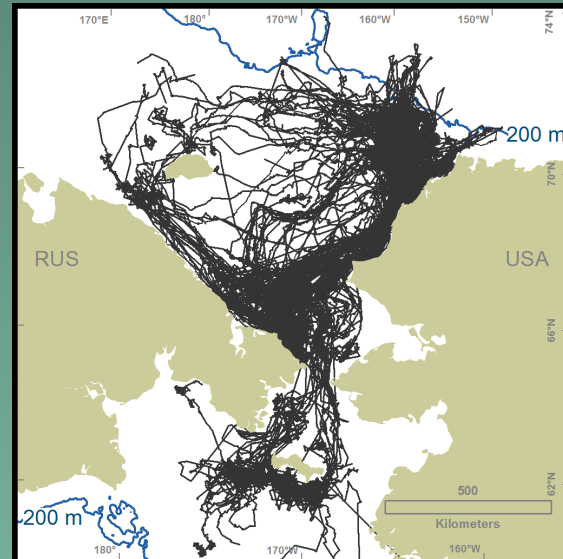
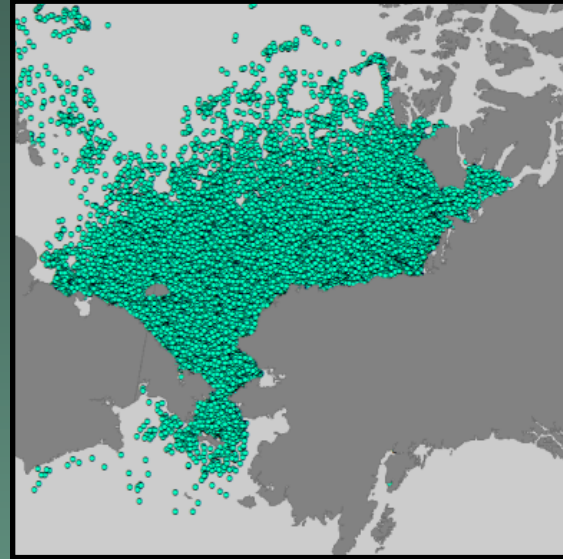
[Pacific Walrus Project website](#)



Tracking data are fundamental to understanding relationships with sea ice



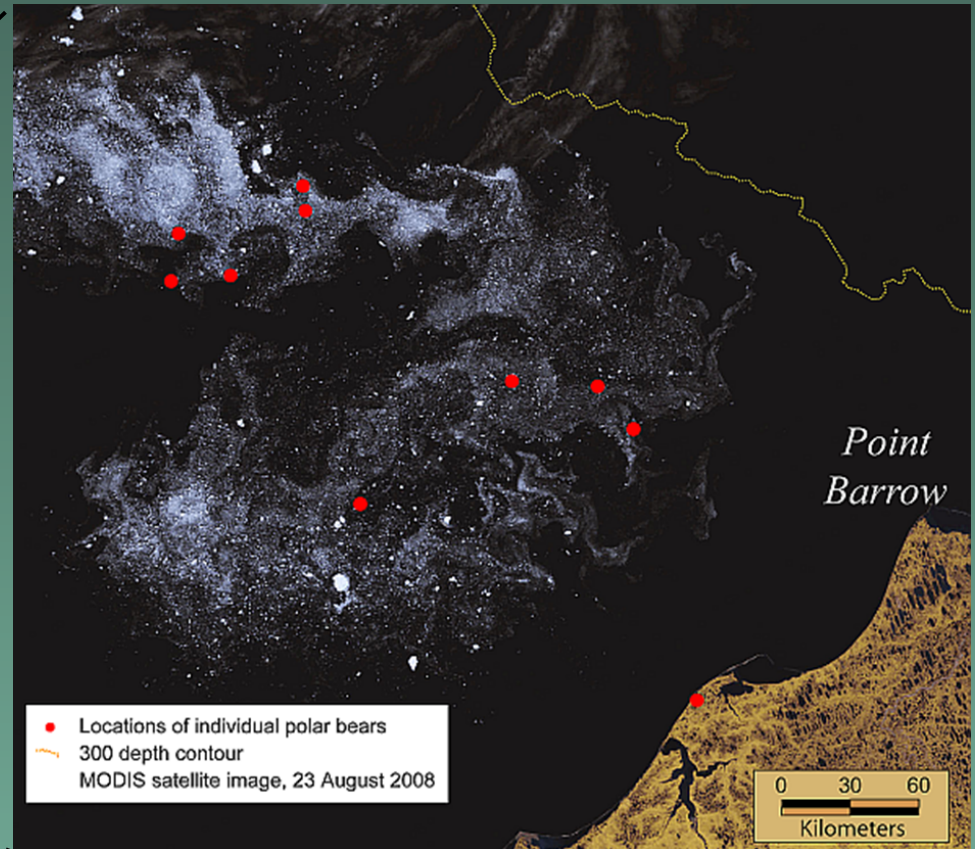
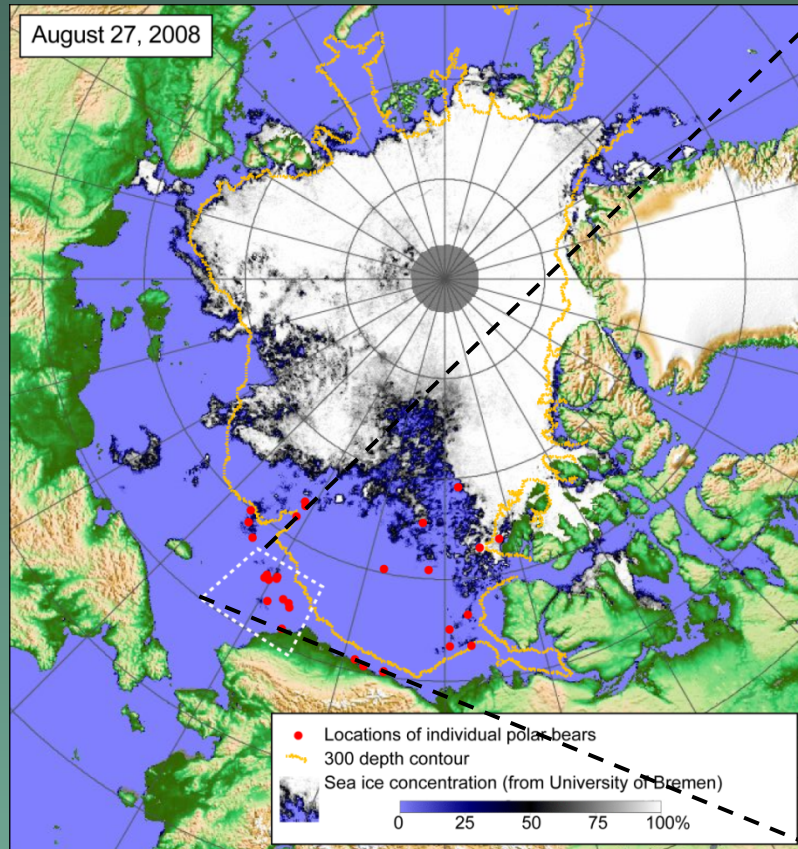
Tracking data are fundamental to understanding relationships with sea ice



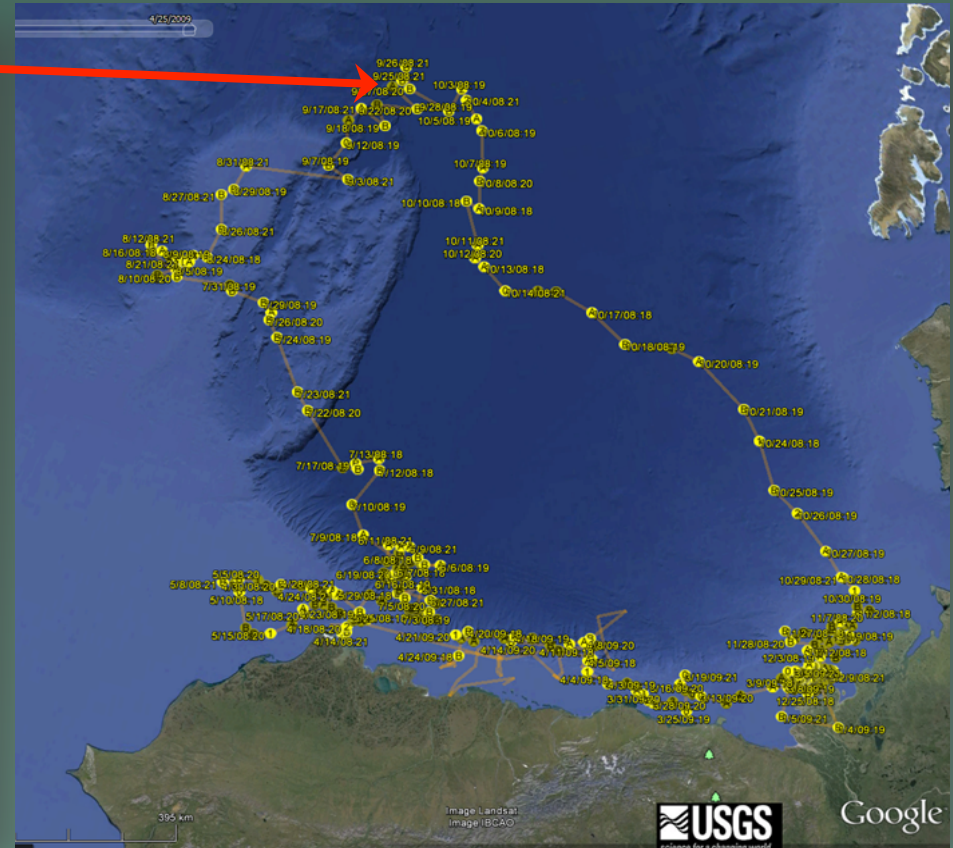
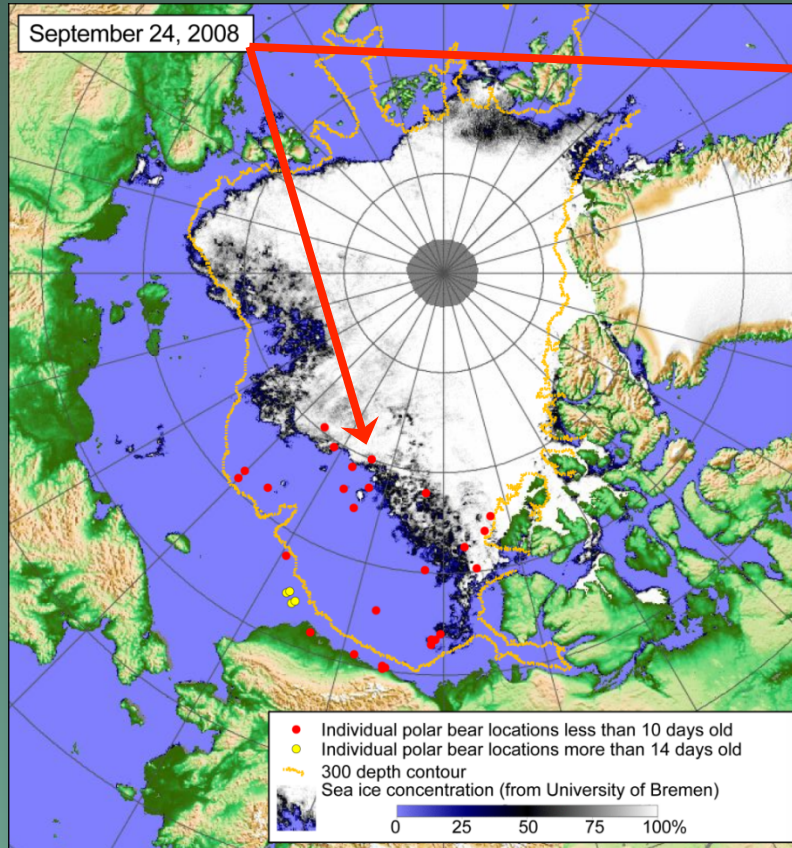
Ursus maritimus



Polar bears must contend with vast areas of rapidly melting sea ice



Long-distance movements to remain on the retreating ice pack



Long-distance movements by polar bears to remain on the retreating ice pack



[Pagano, et al. \(2012\) Can. J. Zool.](#)



Long-distance swimming by polar bears



Modis Image: 22Aug08

From 20Aug08 to 25Aug08, 288.3 km at mean 2.5 km/h

20Aug08

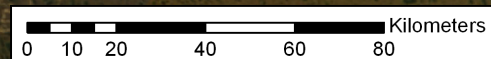
25Aug08

Barrow

Wainwright

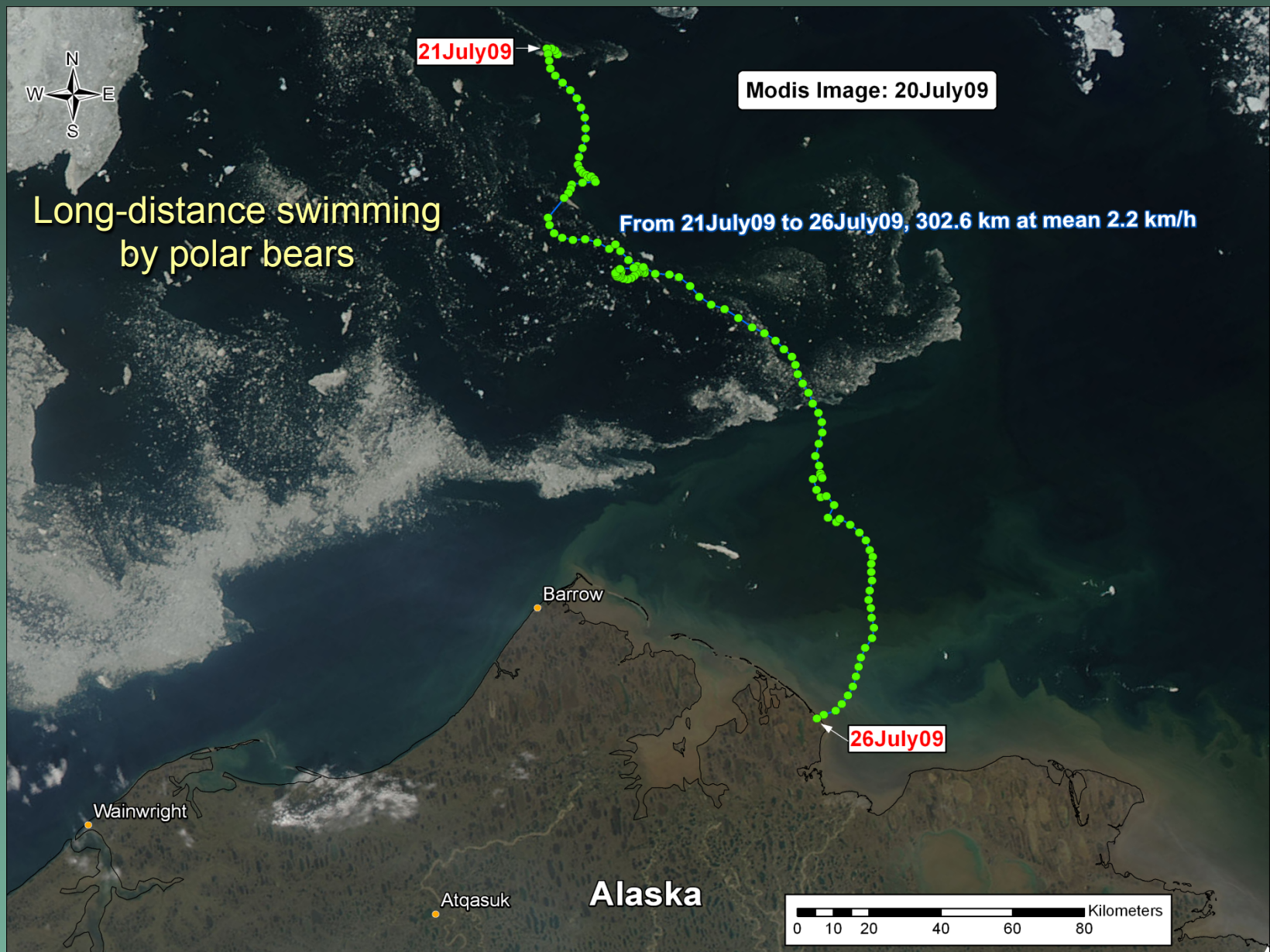
Alaska

Atkasuk



Pagano, et al. (2012) Can. J. Zool.

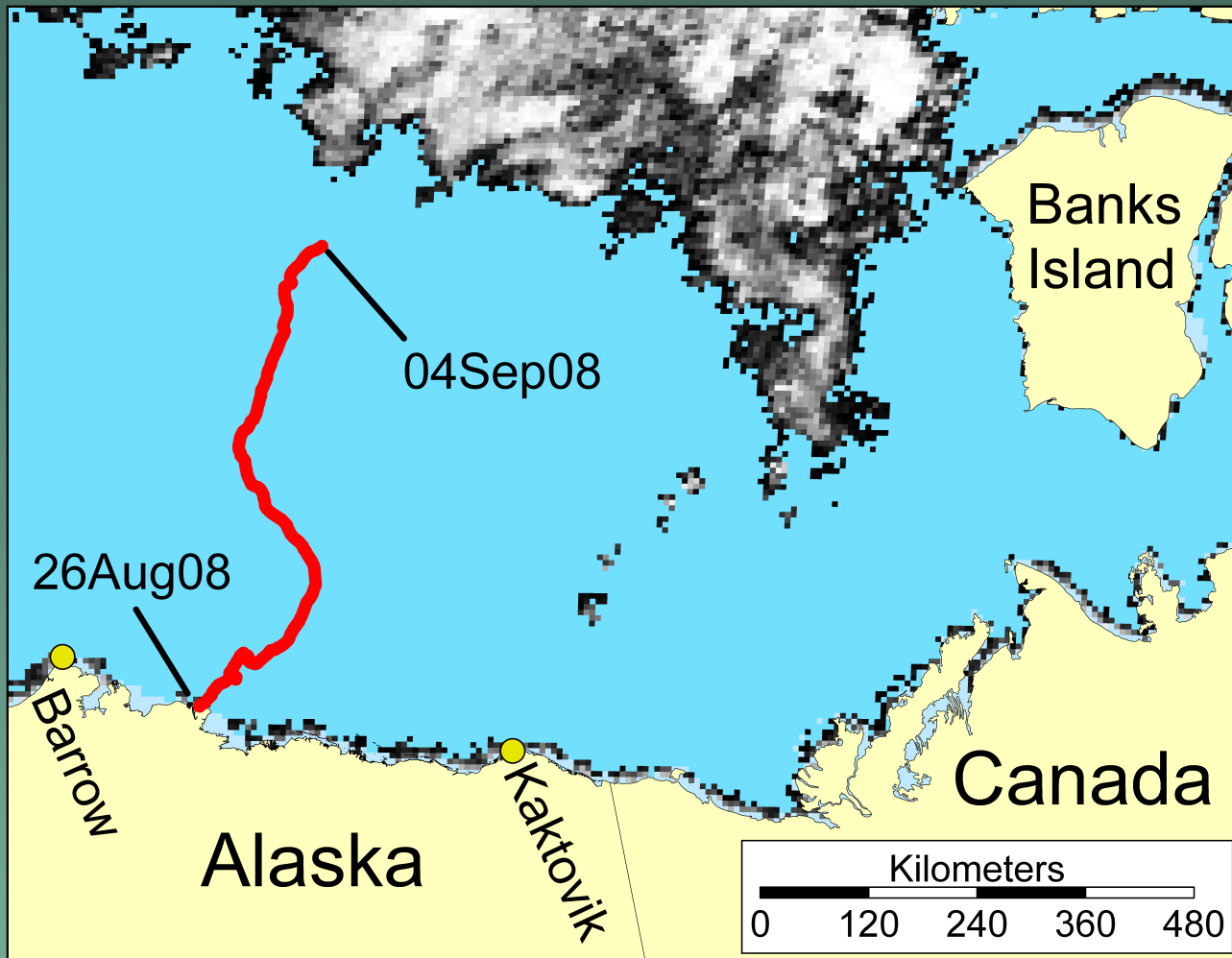




[Pagano, et al. \(2012\) Can. J. Zool.](#)



Adult female polar bear that swam continuously for 9 days and 687 km



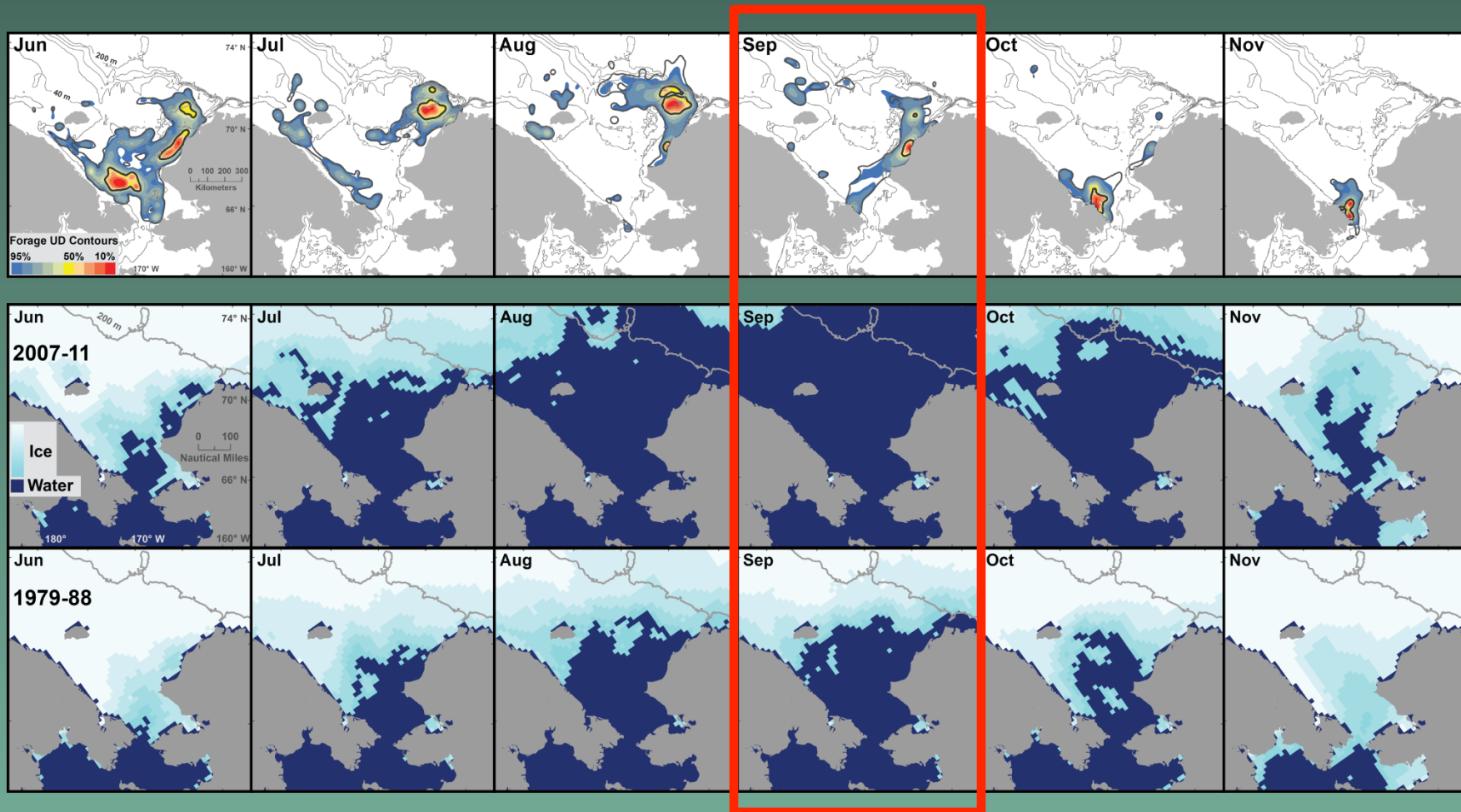
Durner et al. (2011), Polar Biol.



Odobenus rosmarus divergens



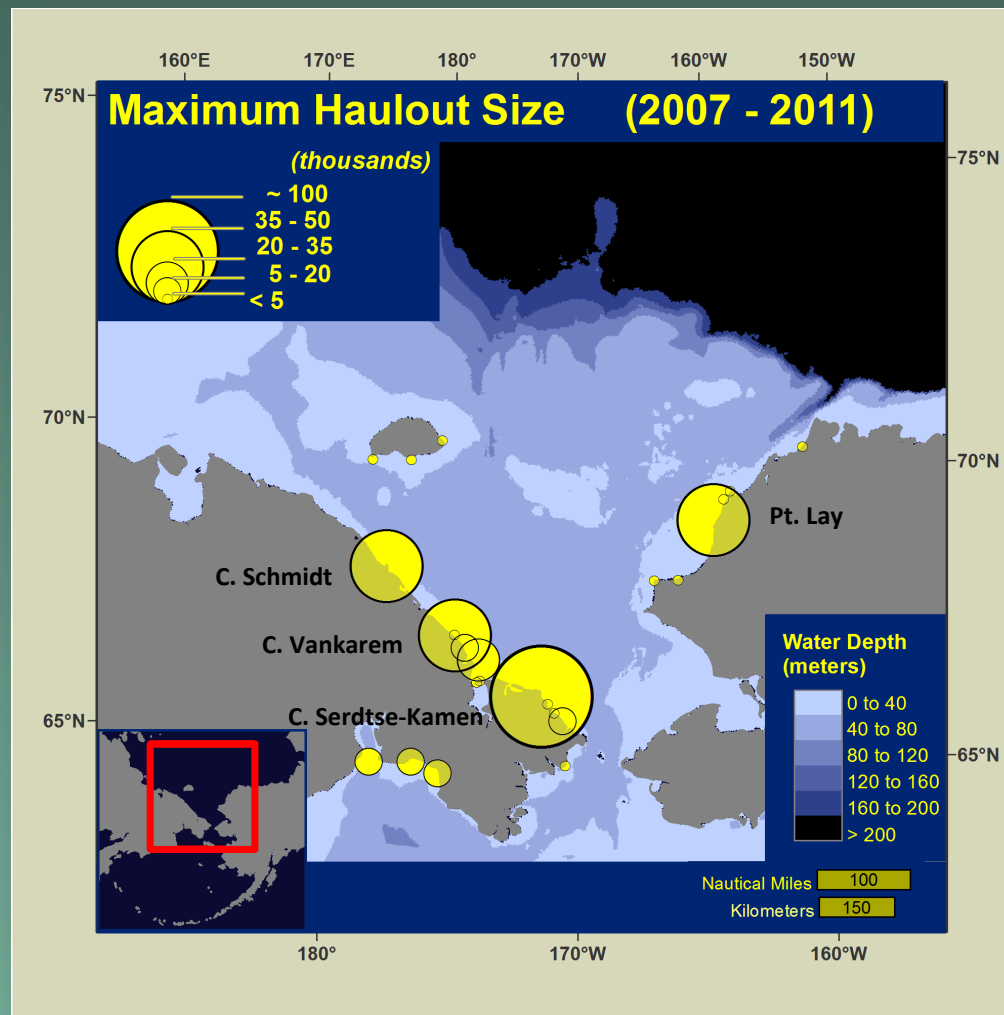
Walrus areas of use in the Chukchi Sea during sparse sea ice cover



Jay, et al. (2012) Mar. Ecol. Prog. Ser.



Summer-fall walrus haul-outs 2007–2011



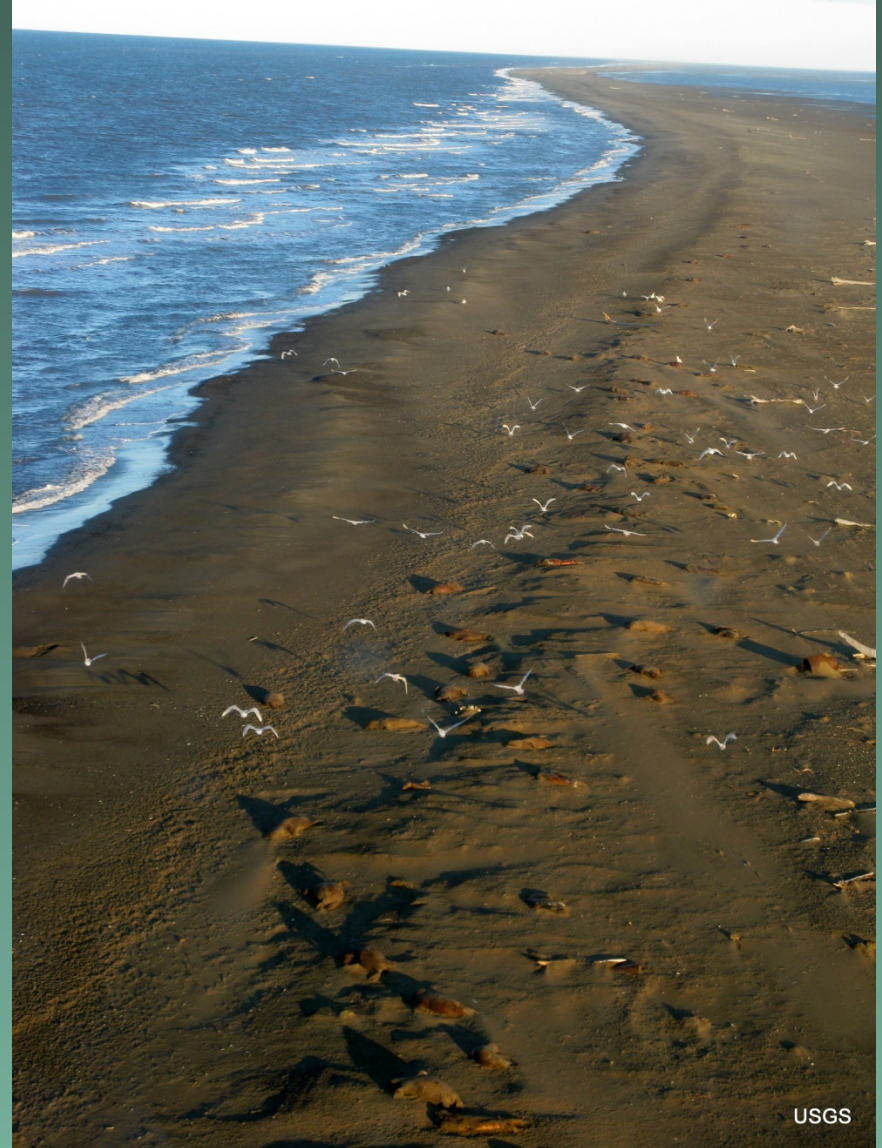
Summer–fall walrus haul-outs are increasing in size and duration



[USGS walrus videos](#)



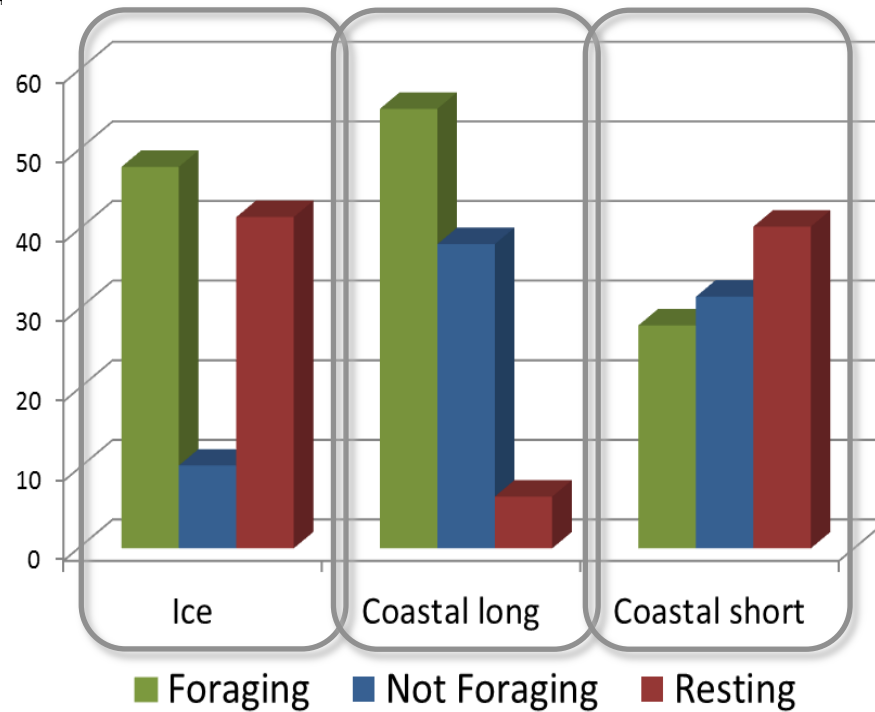
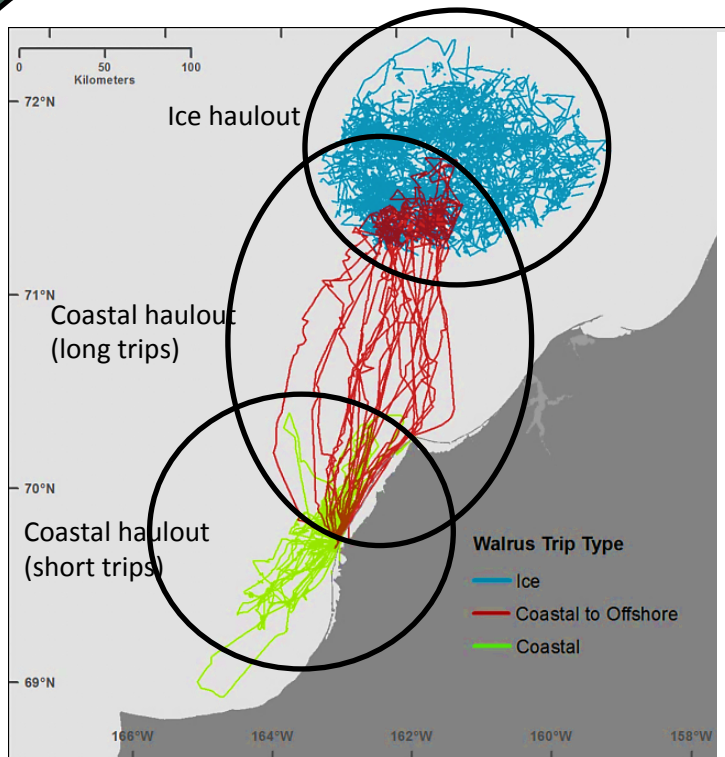
Disturbances at haul-outs are sometimes fatal



<http://pubs.usgs.gov/of/2009/1291/>



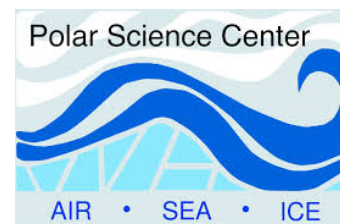
Foraging from land haul-outs is less efficient than from sea ice



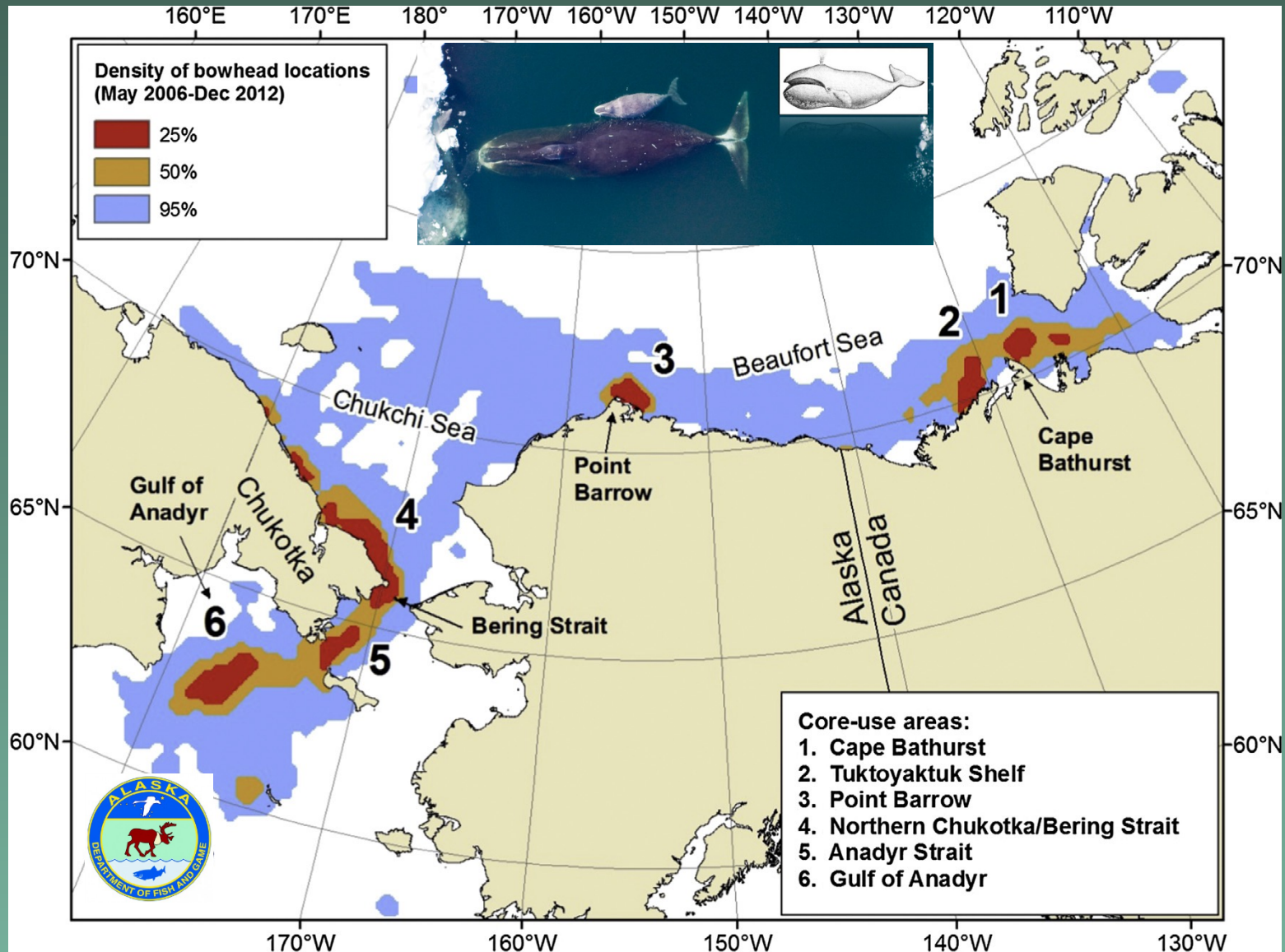
Jay, Fischbach (in prep)



Agencies and institutions involved in Arctic marine ecological research (an incomplete list)



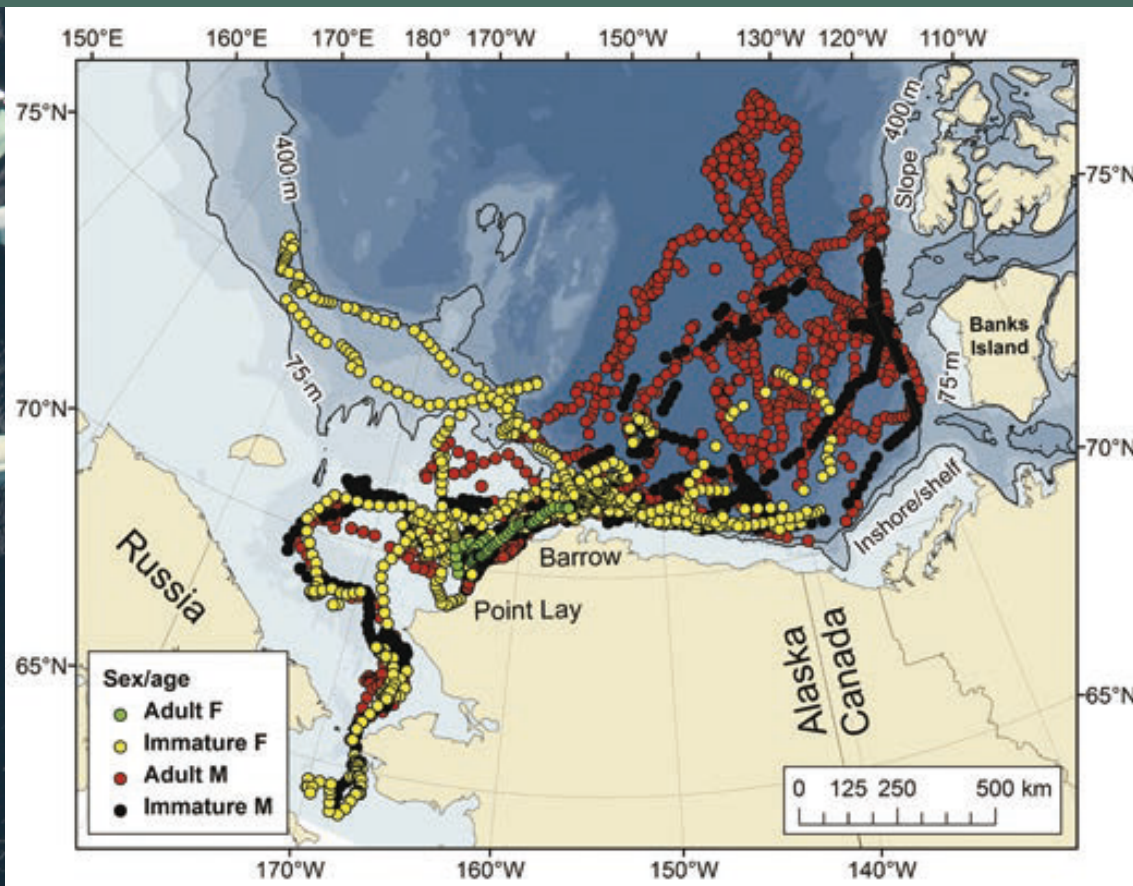
Core-use areas used by bowhead whales, 2006–2012



<http://dx.doi.org/10.1016/j.pocean.2014.08.012>



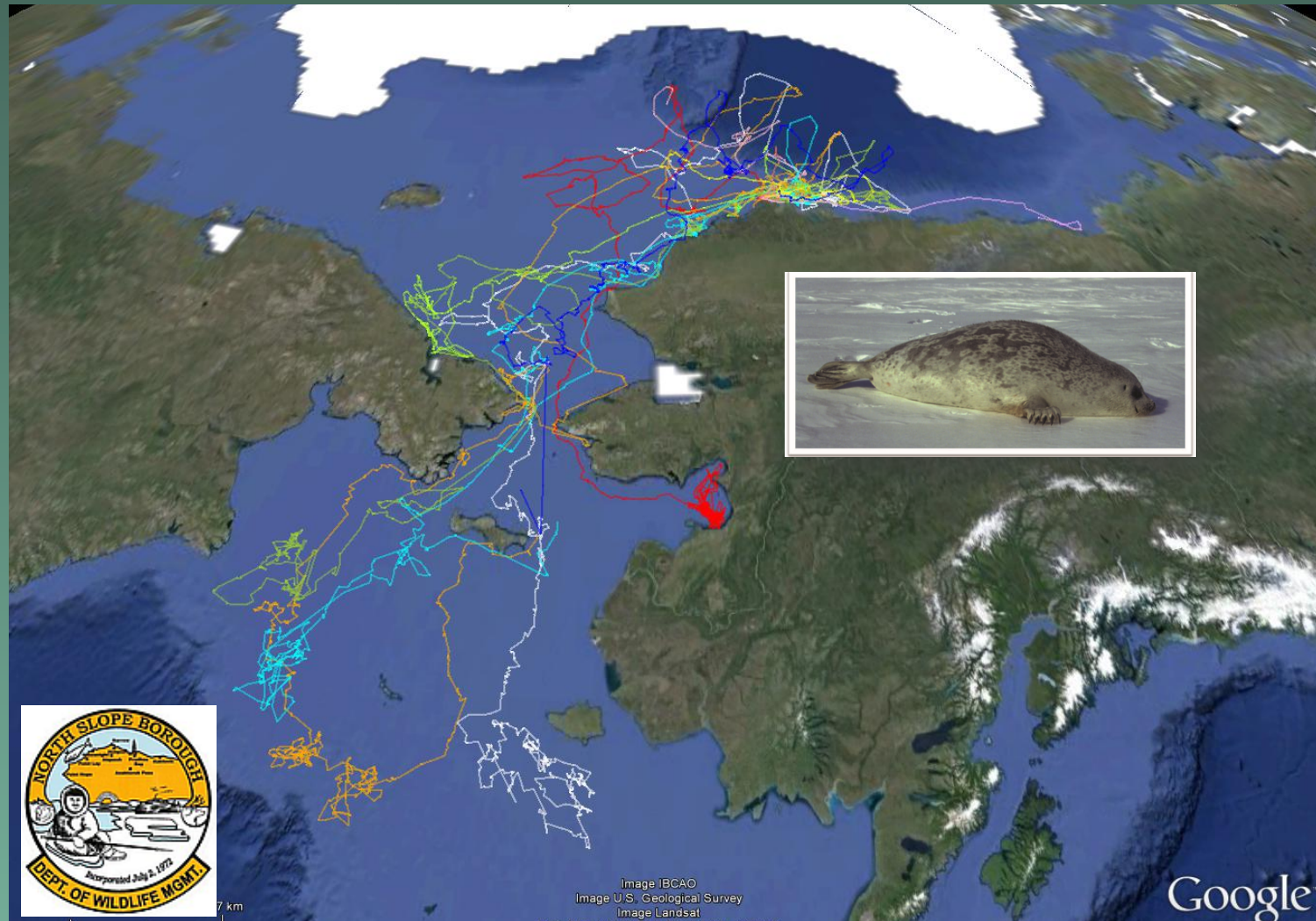
Eastern Chukchi beluga whales, 1998 – 2008



<http://pubs.aina.ucalgary.ca/arctic/Arctic66-4-389.pdf>



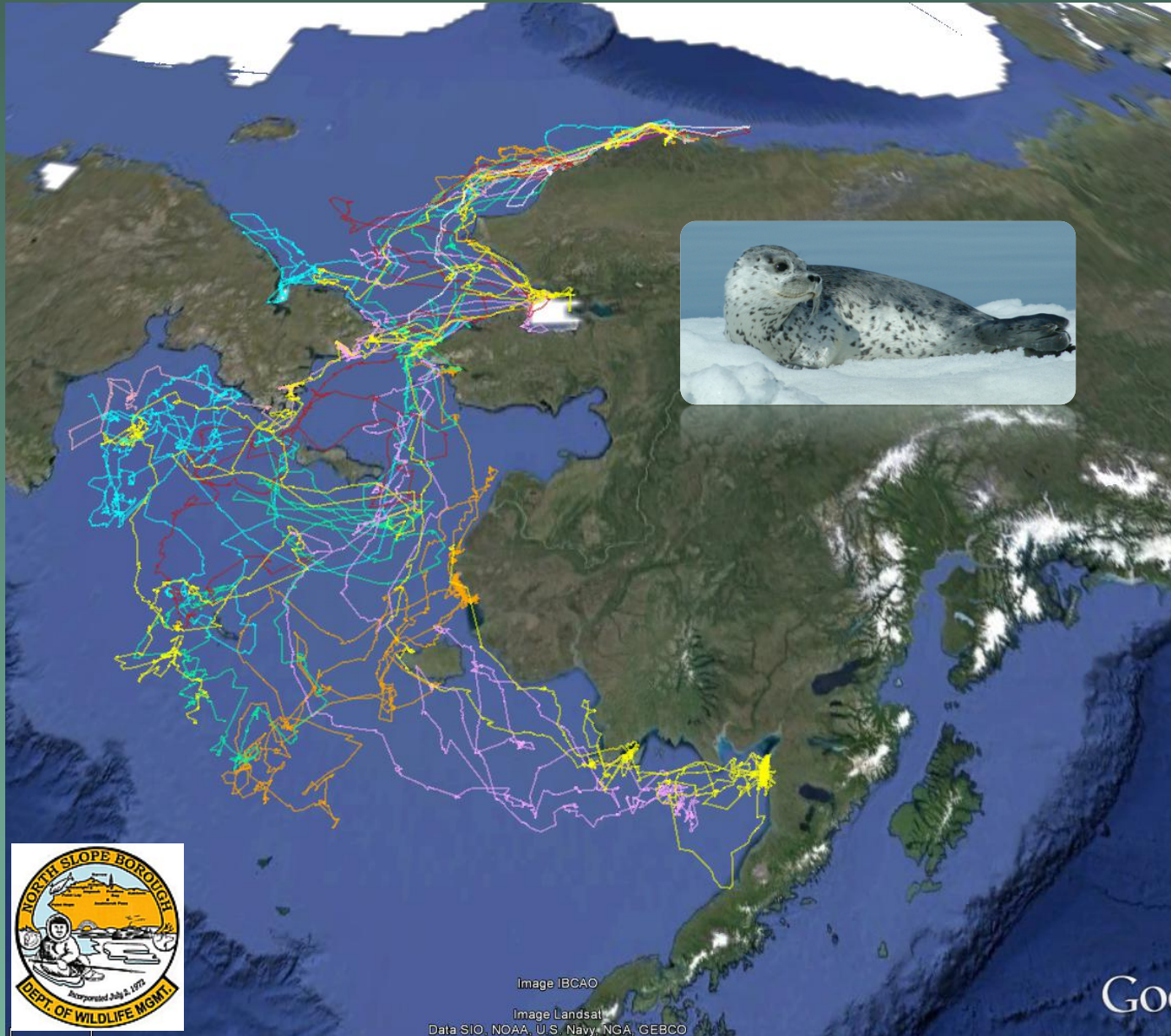
Ringed seals tagged during summer near Barrow



<http://www.north-slope.org/departments/wildlife-management/studies-and-research-projects/ice-seals>



Spotted seals tagged during summer near Barrow



<http://www.north-slope.org/departments/wildlife-management/studies-and-research-projects/ice-seals>



While the Arctic experiences rapid ecological change, vigilant research and monitoring will be key to practicing environmental stewardship.





Photo:
Brendan Smith



Photo:
Brian Battaile

